No. 810,462. PATENTED JAN. 23, 1906.

F. H. BLACKBURN.

APPARATUS FOR MAKING AIR HOLE GLASSWARE.

APPLICATION FILED FEB. 24, 1905.

3 SHEETS—SHEET 1.

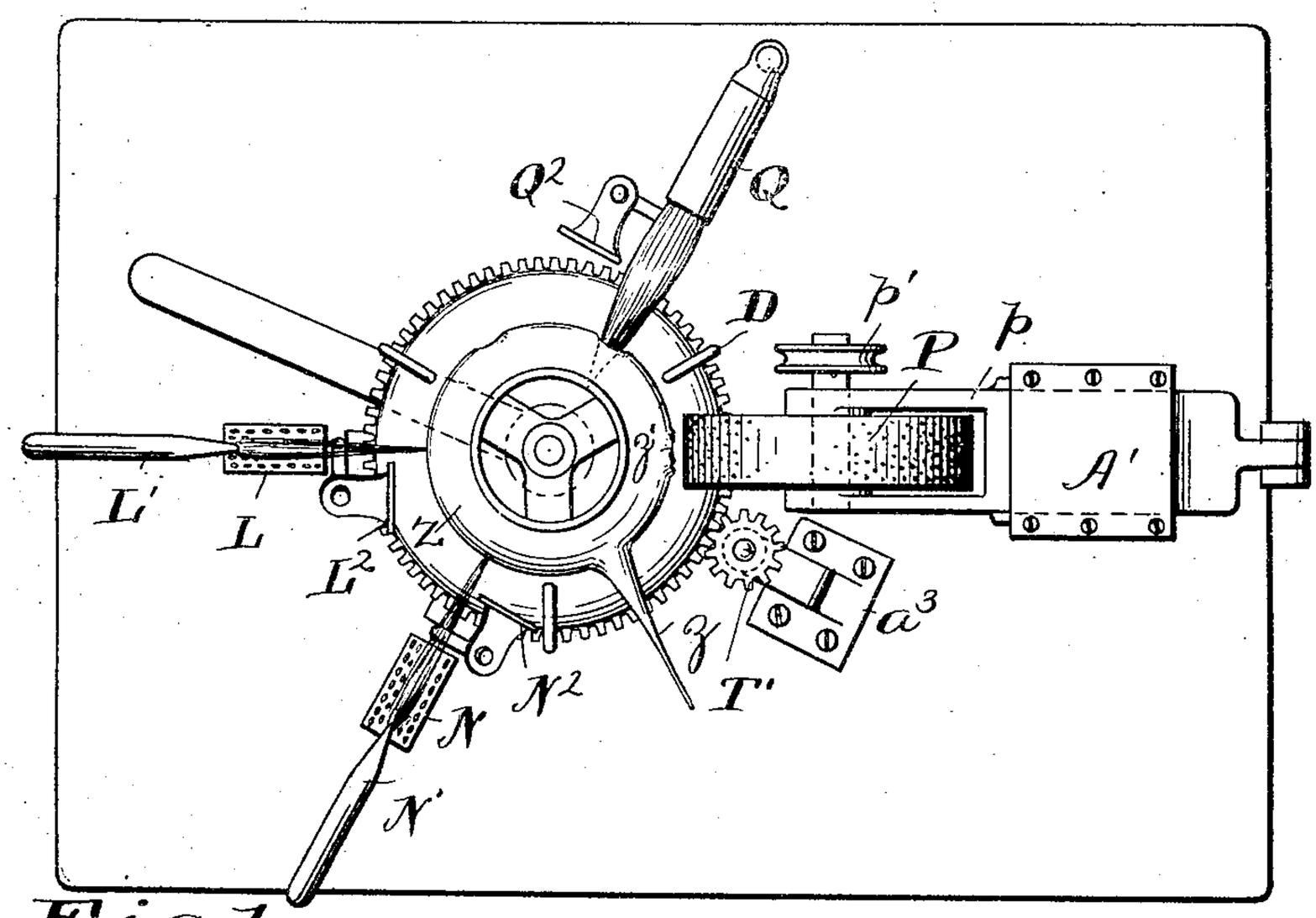
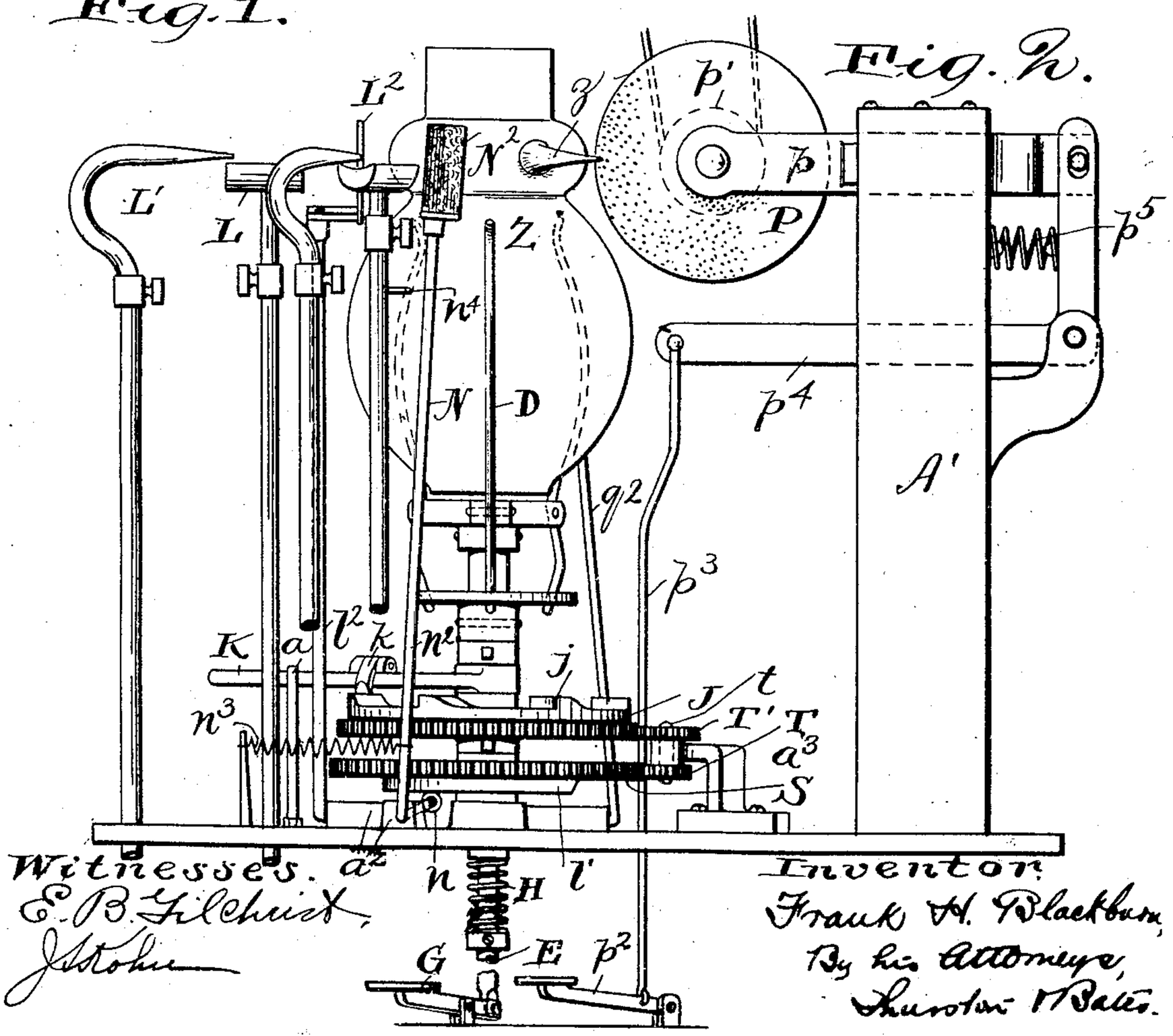


Fig. 1.

Fig. 2.



Witnesses.
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J. L. Kohler

Inventor:
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3 SHEETS—SHEET 2.

Fig. 3.

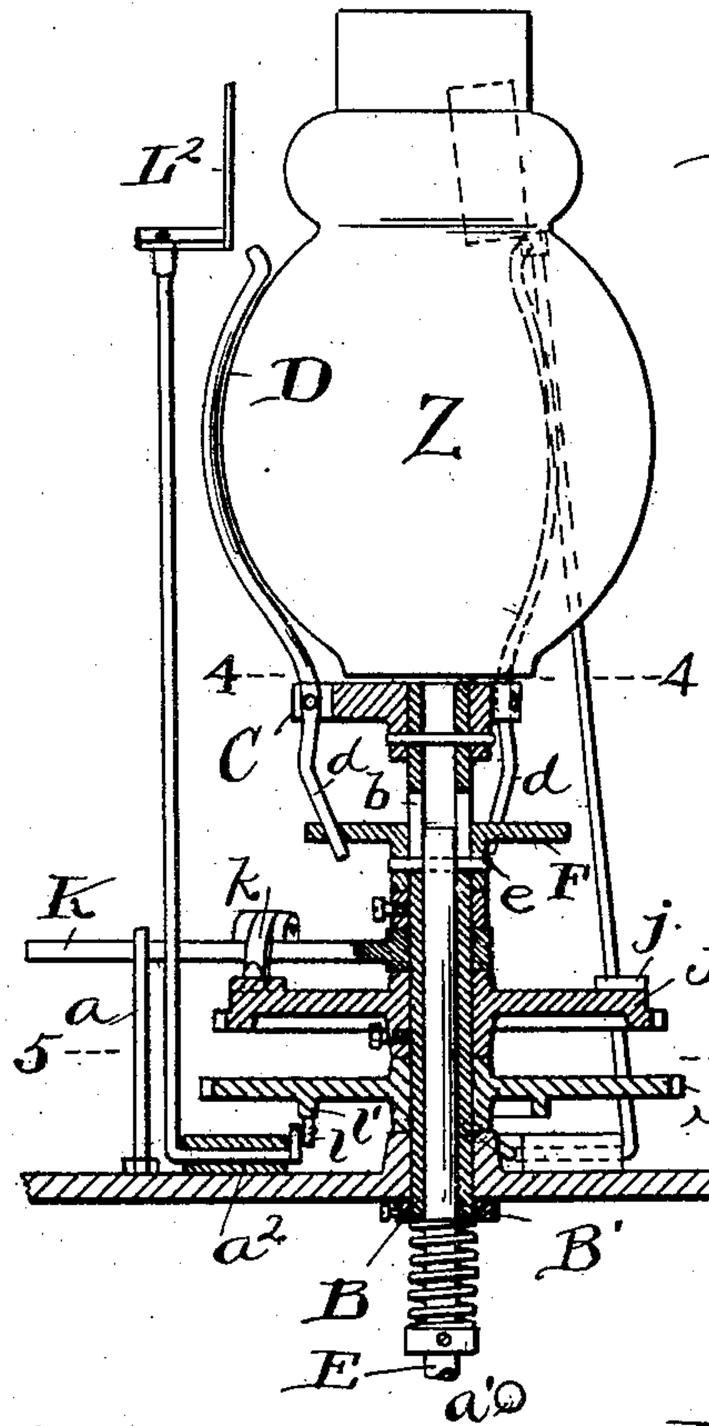


Fig. 4.

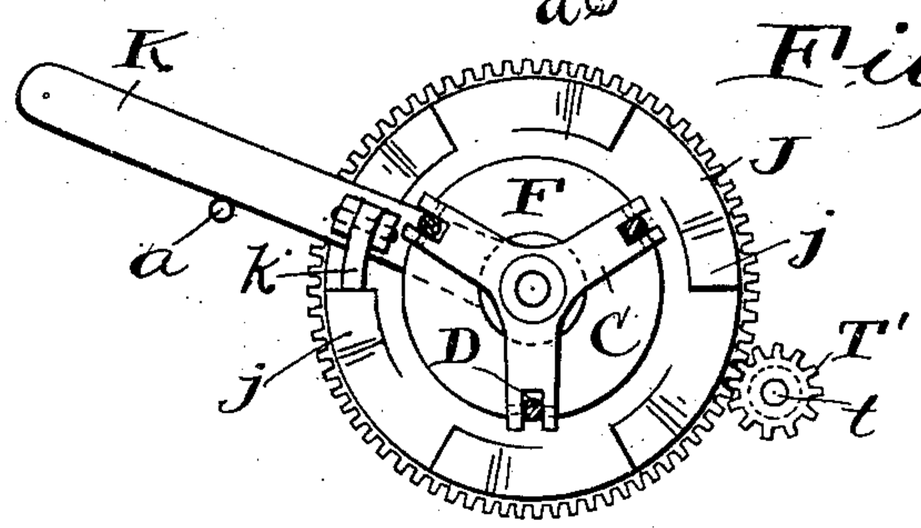
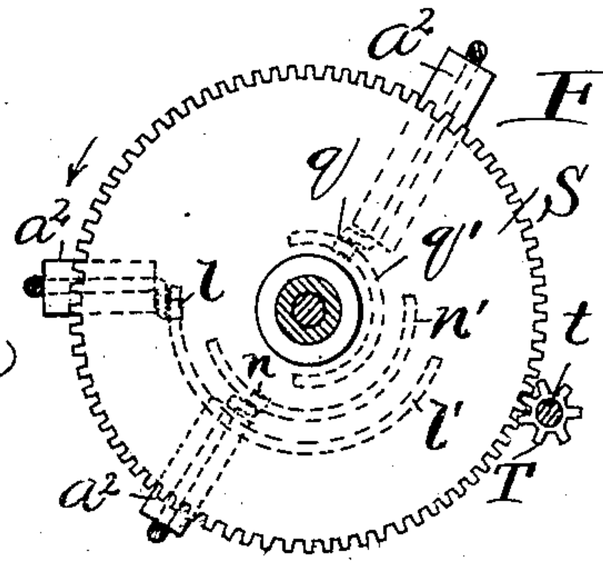


Fig. 5.



Witnesses.
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J. S. Kohn

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3 SHEETS—SHEET 3.

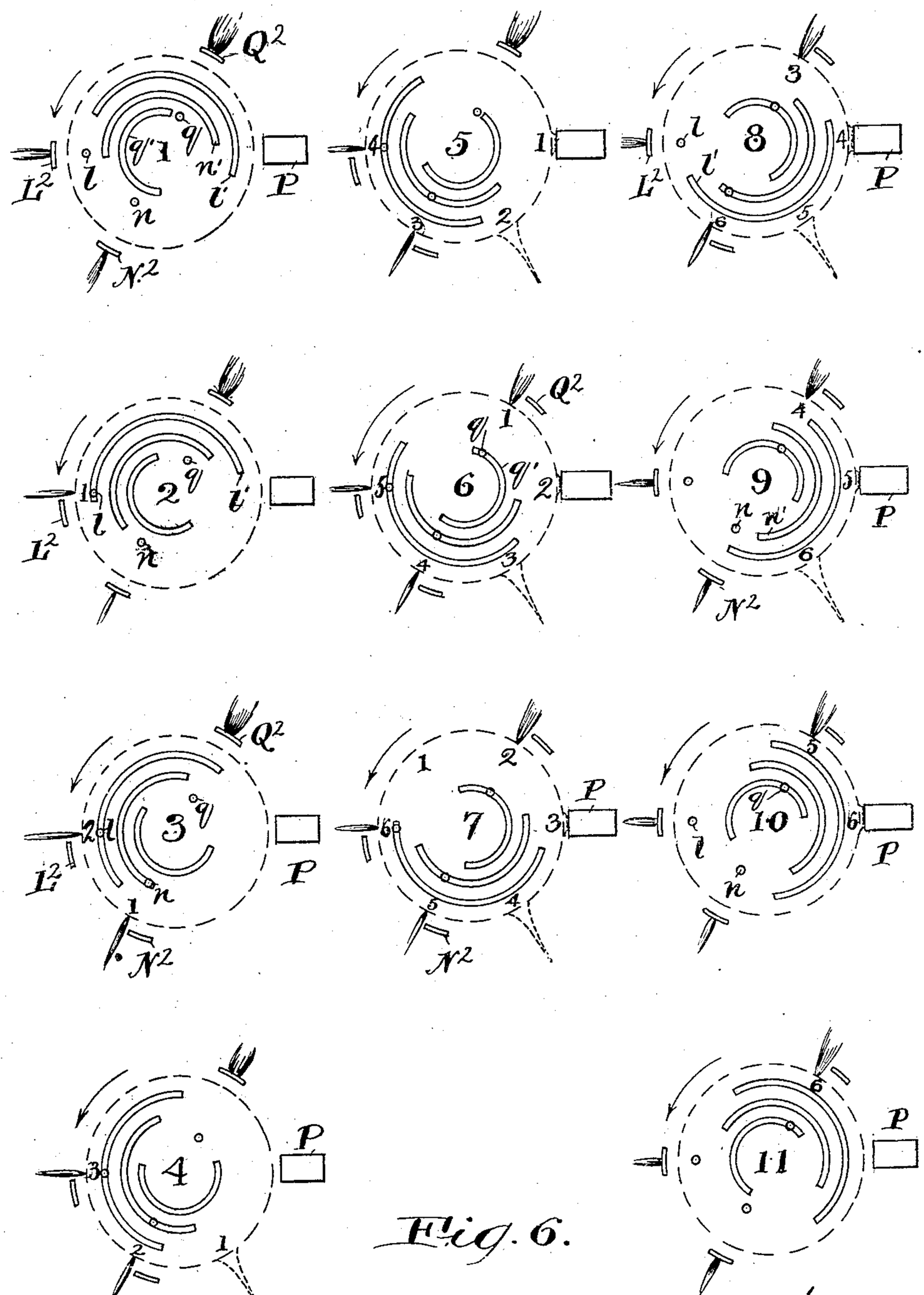

Fig. 6.

Witnesses.
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UNITED STATES PATENT OFFICE.

FRANK H. BLACKBURN, OF FOSTORIA, OHIO, ASSIGNOR TO THE NATIONAL ELECTRIC LAMP COMPANY, OF CLEVELAND, OHIO, A CORPORATION OF NEW JERSEY.

APPARATUS FOR MAKING AIR-HOLE GLASSWARE.

No. 810,462. Specification of Letters Patent. Patented Jan. 23, 1906.

Application filed February 24, 1905. Serial No. 247,163.

To all whom it may concern:

Be it known that I, FRANK H. BLACKBURN, a citizen of the United States, residing at Fostoria, in the county of Seneca and State of Ohio, have invented a certain new and useful Improvement in Apparatus for Making Air-Hole Glassware, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

The object of this invention is to provide an efficient apparatus for the manufacture of air-hole glassware. Such glassware, which is used largely with incandescent gas-burners, consists of a globe having a number of such holes through it in a circumferential row. These holes may be made by subjecting the globe to heating in spots, then causing a member to contact with a heated spot and by being drawn away therefrom to draw out a long projection or horn from each spot, which horn is then broken off and the rough edges ground and then glazed to make a smooth hole. My invention provides an apparatus whereby a single operator may perform such process with speed and certainty.

My invention may be summarized as consisting of the combinations of parts to the above end, as hereinafter more fully explained and as definitely set out in the claims.

In the drawings, Figure 1 is a plan of my apparatus. Fig. 2 is a side elevation thereof. Fig. 3 is a vertical central section. Figs. 4 and 5 are horizontal sections on the correspondingly-numbered lines of Fig. 3. Fig. 6 is a diagram showing the different positions of the globe, the fires, and the cam-plate for controlling them.

Mounted on a suitably-supported bed-plate A is a vertical rotatable sleeve B, carrying at its upper end a spider C, in which are pivoted fingers D, adapted to grasp the globe to be treated, (indicated by Z.) Slidably mounted within the sleeve B is a rod E, which is connected with a collar F, surrounding the sleeve. This connection is made by a pin *e*, carried by the rod E and extending through slots *b* in the sleeve and taking into the hub of the collar. The collar F has holes through it, into which extend the inwardly-inclined ends *d* of the fingers D. By this means when the rod E is raised the lower ends of the fingers are drawn inward, swinging outward their upper portions to admit the globe. When the rod E is drawn downward, the fingers return to the position shown in Figs. 2 and 3, and thus grasp the globe. The upward movement of the rod may be caused by a treadle G, connected with its lower end, while its downward position is normally maintained by a spring H, surrounding it and compressed between a collar on the rod and the lower end of the sleeve B.

Rigidly secured to the sleeve B is a gear J, having ratchet-teeth *j* on its upper surface. There are as many of these teeth as there are holes to be made in the globe—for example, six. Coöperating with the ratchet-teeth is a pawl *k*, carried by a lever K, which is loosely journaled at the sleeve B. Suitable stops *a* and *a'* limit the movement of this ratchet-lever. By its means the globe may be gradually turned round in a step-by-step movement, each step being an integral fraction of a complete rotation.

Located radially about the globe in a position to coöperate therewith are three heaters and a grindstone. The first heater consists of a gas-burner L and the air-pipe L'. This heater is adapted to give the preliminary heating successively to the different spots where the holes are to be. The second heater consists of the gas-burner N and the air-pipe N'. This heater projects a more intense flame against a spot which has already been heated by the first heater. Beyond the second heater is a clear space where the operator may touch the hot end of a rod against a spot which has just been in the intense flame and by drawing it away from the globe draw out a horn thereon. Such horn is shown at *z* in the drawings. When this horn is drawn out, a light blow then upon it breaks it off, leaving a hole with rough edges. To remove the rough edges around the hole, I provide a grindstone P, which is located in the next position—that is, with six-hole glassware—diametrically opposite the first fire. This grindstone is rotatably carried by a sliding frame *p*, mounted in a frame-standard A', and a belt passing around a pulley *p'* maintains the grindstone in rotation. A suitable treadle p^2, connected by a link p^3 and a bell-crank p^4 with the slide,

furnishes means for advancing the grindstone to grind down the rough edges z', formed by breaking off the horn. The spring p^5 returns the grindstone to idle position when the pressure of the treadle is removed. In the next position beyond the grindstone I provide a gas and air burner Q, which projects a glazing-flame into the hole just ground by the grindstone, rounding the edge thereof and completing it. The next position is an idle one. In order to prevent the flames from the various burners acting on the globe at undesired times, I provide three shields L^2 N^2 Q^2, adapted to stand in the path of the flames from the respective burners. These shields are carried on the upper ends of the rods l^2 n^2 q^2. Each rod is bent near its lower end to form a rock-shaft, which is journaled in a block a^2 by the frame. The inner end of this rock-shaft is bent to form an arm carrying a roller, (designated, respectively, l n q.) These rollers coöperate with three cams l' n' q', respectively, which when in engagement with the rollers hold the shields in the path of the flames. The cams are of arcual form and are rigid with the under face of a gear S. This gear is connected with the gear J by means of a pair of pinions T and T', connected together by a shaft t, journaled in a suitable frame-bracket a^3. In the embodiment shown in the drawings, where there are six holes to be made and five operations for each hole, the globe being turned one-sixth of the way for each operation, there must be eleven of these step-by-step movements, for it takes six steps to carry any given spot around from idle position past the five activities back to idle position, and it takes one additional step for each of the other five holes. These eleven positions require the various shields placed accordingly, and to accomplish this I arrange the gearing between the globe-holder and the cams, so that the globe must make one and five-sixth rotations—that is, eleven steps each one-sixth of a rotation—to one complete rotation made by the cam-gear S. A proper selection of gear will cause this—as, for example, seventy-two teeth on the gear J, twelve teeth on the pinion T', seven teeth on the pinion T, and seventy-seven on the gear S. Each shield is provided with a suitable spring and a stop tending to maintain the shield across the flame when the cam is out of engagement. Such spring in the case of the shield N^2 is shown at n^3 and the stop at n^4. Similar springs and steps are provided for the other shields. The diagram Fig. 6 represents the globe in each of the eleven positions and shows the corresponding positions of the cams and the shields. These positions are as follows:

No. 1. All shields are up. This is the idle position, when the new globe is inserted and the finished globe removed.

No. 2. Cam l' engages roller l and shield L^2 is down. In this position the first spot receives its preliminary heating.

No. 3. Rollers l and n are engaged and shields L^2 and N^2 are down. The first spot is receiving its intense heating and the second spot its preliminary heating.

No. 4. Spot No. 1 is having a horn drawn out, Spot No. 2 is receiving the intense heating, and Spot No. 3 the preliminary heating.

No. 5. The horn on spot No. 1 has been broken off and the operator draws up the grindstone to grind off the rough edges around the hole. The horn is drawn out on spot No. 2, and spot No. 3 receives the intense heating and No. 4 the preliminary heating.

No. 6. The cam q' has now engaged the roller q and the shield Q^2 is down, hole No. 1 is receiving the glazing-flame, No. 2 is being ground, No. 3 drawn out, No. 4 intense heating, and No. 5 preliminary heating.

No. 7. The finished hole No. 1 is now in idle position, No. 2 is being glazed, No. 3 ground, No. 4 drawn out, No. 5 intensely heated, and No. 6 preliminary heating. (This is the position of the glassware shown in the plan of the apparatus, Fig. 1.)

No. 8. Cam l' has now passed off the roller l and the shield L^2 is up. The first hole stands unaffected in front of the shield L^2, the second hole is in idle position, the third hole is being glazed, the fourth hole ground, the spot for the fifth hole is being drawn out, and the sixth intensely heated.

No. 9. Cam n' has now cleared the roller n and shield N^2 is now up, cutting off the intense flame. The first, second, and third holes, which are finished, are now idle, the fourth hole is being glazed, fifth hole is being ground, and the sixth is being drawn out.

No. 10. Four finished holes are idle, the fifth is being glazed, and sixth is being ground.

No. 11. Five finished holes are idle and the sixth is being glazed.

The next step again brings the parts into the first position. All of the cams disengage their rollers and all of the shields are therefore up in this position. The finished globe is removed and a new one put in place.

It will be seen that this apparatus one operator can perform with great speed all the steps involved in making the six holes. With the foot the operator governs the clutch which holds the globe. With the left hand he operates the lever K to turn the globe the successive steps. With the right hand he touches a small rod to the intensely-heated spot to draw out the horn and then strikes that horn with the rod to break it off. Just preceding the drawing out of the horn he heats the end of the rod by holding it in one of the flames. With his right foot the operator controls the grindstone to grind off the rough edges. The globes are supplied to him in a warmed condition and he puts one in the

machine, completes it, and then places it in the cooling-box to cool off gradually and puts another in the clutch, and so on continuously.

I claim—

1. In an apparatus for making air-hole glassware, the combination of a heater for the glassware, means for rotating the glassware, and means controlled according to such rotation for governing the heater.

2. In an apparatus for making air-hole glassware, the combination of means for rotating the glassware, a plurality of heaters adapted to act on the glassware, and means operating automatically with the rotation of the glassware to shut off said heaters successively.

3. In an apparatus for making air-hole glassware, the combination of a support for the glassware, a burner, means for rotating one with reference to the other, and automatically-operated means for shutting off the flame at predetermined positions of the glassware.

4. In an apparatus for making air-hole glassware, the combination of a plurality of burners placed radially about the glassware, means for rotating said glassware, shields for said burners, and means for moving them into and away from the flames from said burners.

5. In an apparatus for making air-hole glassware, the combination of a support for the glassware, heaters placed radially thereabout, shields for interrupting the flames from said heaters, means for rotating said support, and means controlled thereby for automatically operating said shields.

6. In an apparatus for making air-hole glassware, the combination of a burner, means for rotating the glassware, a shield for said burner, and mechanism for moving said shield into and out of the flame from said burner, said mechanism being controlled automatically according to the rotation of said support.

7. In an apparatus for making air-hole glassware, the combination of mechanism for rotating the glassware by successive steps, agencies to adapt it to coöperate with the glassware and placed radially about the same, and mechanism timed with respect to the rotation of the glassware for controlling said agencies.

8. In an apparatus for making air-hole glassware, the combination of a plurality of agencies located around the material to be acted upon and adapted to successively coöperate with said material, means for rotating the material, rotatable mechanism for governing said agencies, and means for rotating the same at a different speed from the material, whereby the material may be acted upon at a greater number of positions than that presented by one rotation thereof.

9. In an apparatus for making air-hole glassware, the combination of agencies to adapt it to coöperate with the glassware and placed radially about the same, means for rotating the glassware by successive steps, and mechanism governed by said means for controlling said agencies, said mechanism making a complete rotation at the same time that the glassware makes something more than a complete rotation, whereby the several agencies may act simultaneously around the glassware but will be prevented from acting on the finished holes.

10. In an apparatus for making air-hole glassware, the combination of mechanism for rotating the glassware by steps which amount each to an integral fraction of a complete rotation, a plurality of agencies placed around the glassware and adapted to coöperate with it at points whose distance apart correspond to a step or an integral multiple thereof, whereby as the glassware is rotated the spot which was acted upon by one agency comes into coöperation with another agency, and means governed according to said rotation for controlling said agencies.

11. In an apparatus for making air-hole glassware, the combination of a support for the glassware, mechanism for rotating said support by steps which amount to an integral fraction of a complete rotation, a plurality of agencies placed around the glassware and adapted to coöperate with it, and means governed according to said rotation for controlling said agencies, said means making a complete rotation while said support is making some steps more than a complete rotation, whereby on the second rotation of the glassware the agencies may not interfere with the completed portions thereof.

12. In an apparatus for making air-hole glassware, the combination of a support, means for rotating the same intermittently, a preliminary heater, an intense heater and a glazing-heater placed radially about the glassware on said support, whereby the same spot may be subjected successively to the three heaters, there being a position intermediate of the second heater and the glazer to allow the formation of a hole at the heated spot.

13. In an apparatus for making air-hole glassware, the combination of a heating-burner and a glazing-burner, means for rotating the glassware by successive steps to locate a given spot thereof in front of the heating-burner and later in front of the glazing-burner, an intermediate step leaving such spot in position to have a hole made through it.

14. In an apparatus for making air-hole glassware, the combination of a heating-burner and a glazing-burner, means for rotating the glassware by successive steps to position a given spot thereof in front of the heating-burner and later in front of the glazing-

burner, an intermediate step leaving such spot in position to have a horn formed on it and broken off and the rough edge ground down, and means located for grinding such rough edge.

15. In an apparatus for making air-hole glassware, the combination of heaters and a grinder placed radially, and means for rotating the glassware on its axis to bring given spots successively to the action of the heaters and the grinder.

16. In an apparatus for making air-hole glassware, the combination of a support for the glassware, a heater and a grindstone placed radially about the same, means for rotating said support to bring a given spot on the glassware successively to said heater, then to a position where a horn may be formed on it, and then to said grindstone.

17. In an apparatus for making air-hole glassware, the combination of a ratchet mechanism for rotating the glassware step by step, a series of heaters placed about the glassware, cams for controlling said heaters, and means for operating said cams according to the rotation of the glassware.

18. In an apparatus for making air-hole glassware, the combination of means for intermittently rotating the glassware, a plurality of flame-producers placed radially about the glassware, individual shields adapted to interrupt such flames, cams for operating said shields mounted on a common support, and mechanism for rotating said cams at a definite rate in proportion to the rotation of the glassware.

19. In an apparatus for making air-hole glassware, the combination of means for rotating the glassware by steps which are each an integral fraction of a complete rotation, means for heating spots on said glassware, mechanism for controlling such means, said mechanism including cams connected with the glassware-rotating mechanism.

20. In an apparatus for making air-hole glassware, the combination of means for rotating the glassware by steps which are each an integral fraction of a complete rotation, means for heating spots on said glassware, mechanism for controlling such means including cams connected with the rotating mechanism and timed so that the rotating mechanism makes at least two complete rotations minus one step when the cams make one complete rotation.

21. In an apparatus for making air-hole glassware, the combination of a support for the glassware, heaters coöperating therewith and placed radially about the glassware separated by angles of sixty degrees or a multiple thereof, means for rotating said support by steps of sixty degrees, cams for controlling said heaters, and mechanism for giving said cams one complete rotation when the support is given one and five-sixths rotations.

22. In an apparatus for making air-hole glassware, a support for the glassware, ratchet mechanism for rotating the same by steps, there being as many steps in a complete rotation as there are holes to be made in the glassware, burners for projecting flames against the glassware, means for controlling such flames, cams for operating said means, said cams being geared with said ratchet mechanism to make a complete rotation when the support is making at least one rotation and a fraction of a second rotation whose denominator is the number of holes to be in the finished product, and whose numerator is one less than the number of holes.

23. In an apparatus for making air-hole glassware, a rotatable chuck, means for opening and closing the same, means for rotating said chuck on its axis by intermittent movements to bring the glassware successively into coöperation with different characters of heaters, combined with radially-placed heaters of different characters.

24. In an apparatus for making air-hole glassware, the combination of a support, means under the control of the operator for rotating the same intermittently, a heater, means automatically controlled by said rotation for governing said heater, a grinder, and means under the control of the operator for causing the same to engage the glassware.

25. In an apparatus for making air-hole glassware, the combination of a heating-burner, a glazing-burner, means for rotating the glassware on its axis by successive steps to locate a given spot thereof in front of the heating-burner, and later in front of the glazing-burner, there being means for causing said spot to stop temporarily in an unobstructed position between such burners where a hole may be made through it.

26. In an apparatus for making air-hole glassware the combination of a heating-burner, a glazing-burner, means for rotating the glassware on its axis by successive steps to locate a given spot thereof in front of the heating-burner, and later in front of the glazing-burner, there being means for causing said spot to stop temporarily in two positions intermediate of the burners, the first position allowing the formation of a horn on the glassware, and a grindstone at the second position.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

FRANK H. BLACKBURN.

Witnesses:
H. S. BLACK,
F. C. MAXHEIMER.